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1. A cytochrome P450 monooxygenase which is capable of at least one of the following reactions:
  - a) oxidation of optionally substituted N-, O- or S-heterocyclic mono- or polynuclear aromatic compounds;
  - b) oxidation of optionally substituted mono- or polynuclear aromatics;
  - c) oxidation of straight-chain or branched alkanes and alkenes;
  - d) oxidation of optionally substituted cycloalkanes and cycloalkenes;where the monooxygenase is derived from cytochrome P450 monooxygenase BM-3 from *Bacillus megaterium* having an amino acid sequence according to SEQ ID NO:2, which has at least one functional mutation in at least one of the amino acid sequence regions 172-224, 39-43, 48-52, 67-70, 330-335, 352-356, 73-82 and 86-88; except the single mutant Phe87Val.
2. A monooxygenase as claimed in claim 1, which has at least one functional mutation in at least one of the sequence regions 73-82, 86-88 and 172-224.
3. A monooxygenase as claimed in claim 1, which has at least one of the following mono- or polyamino acid substitutions:
  - a) Phe87Val, Leu188Gln; or
  - b) Phe87Val, Leu188Gln, Ala74Gly;and functional equivalents thereof which are capable of at least one of the above oxidation reactions.

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4. A nucleic acid sequence coding for a monooxygenase according to claim 1.
5. An expression construct comprising, under the genetic control of regulatory nucleic acid sequences, a coding sequence which comprises a nucleic acid sequence according to claim 4.
6. A vector comprising at least one expression construct according to claim 5.
7. A recombinant microorganism transformed by at least one vector as claimed in claim 6.
8. A microorganism as claimed in claim 7, selected from bacteria of the genus *Escherichia*.
9. A process for the microbiological oxidation of an N- or S-heterocyclic mono- or polynuclear aromatic compound which comprises
  - a1) culturing a recombinant microorganism which expresses a cytochrome P450 monooxygenase of bacterial origin in a culture medium, in the presence of an exogenous or intermediately formed substrate; or
  - a2) incubating a substrate-containing reaction medium with a cytochrome P450 monooxygenase of bacterial origin; and
  - b) isolating the oxidation product formed or a secondary product thereof from the medium.
10. A process as claimed in claim 9, wherein the exogenous or intermediately formed substrate is selected from optionally substituted – or S-heterocyclic mono- or polynuclear aromatic compounds.

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11. A process as claimed in claim 9, where the monooxygenase is derived from cytochrome P450 monooxygenase BM-3 from *Bacillus megaterium* having an amino acid sequence according to SEQ ID NO:2, which has at least one functional mutation in at least one of the amino acid sequence regions 172-224, 39-43. 48-52. 67-70, 330-335, 352-356, 73-82 and 86-88.
12. A process as claimed in claim 11, where the mutant has at least one of the following mono- or polyamino acid substitutions:
- a) Phe87Val;
  - b) Phe87Val, Leu188Gln; or
  - c) Phe87Val, Leu188Gln, Ala74Gly.
13. A process for microbiological oxidation of optionally substituted mono- or polynuclear aromatics, straight-chain or branched alkanes or alkenes, or optionally substituted cycloalkanes or cycloalkenes, which comprises
- a1) culturing the recombinant cytochrome P450-producing microorganism as claimed in claim 7 in a culture medium, in the presence of an exogenous or intermediately formed substrate; or
  - a2) incubating a substrate-containing reaction medium with a cytochrome P450 monooxygenase derived from cytochrome P450 monooxygenase BM-3 from *Bacillus megaterium* having an amino acid sequence according to SEQ ID NO:2, which has at least one functional mutation in at least one of the amino acid sequence regions 172-224, 39-43. 48-52.

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67-70, 330-335, 352-356, 73-82 and 86-88; and

- b) isolating the oxidation product formed or a secondary product thereof from the medium;

where the monooxygenase mutant Phe87Val is not excluded.

14. A process as claimed in claim 13, wherein the exogenous or intermediately formed substrate is selected from:

- a) optionally substituted mono- or polynuclear aromatics;
- b) straight-chain or branched alkanes and alkenes;
- c) optionally substituted cycloalkanes and cycloalkenes.

16. A process as claimed in claim 13, where the cytochrome P450 monooxygenase has at least one of the following mono- or polyamino acid substitutions:

- a) Phe87Val;
- b) Phe87Val, Leu188Gln; or
- c) Phe87Val, Leu188Gln, Ala74Gly.

17. A process as claimed in claim 9, wherein, as exogenous substrate, at least one compound selected from the groups a) to d) of compounds defined above is added to a medium and the oxidation is carried out by enzymatic reaction of the substrate-containing medium in the presence of oxygen at a temperature of approximately 20 to 40°C and a pH of approximately 6 to 9, where the substrate-containing medium additionally contains an approximately 10- to 100-fold molar excess of reduction equivalents based on the substrate.

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18. A process as claimed in claim 17, wherein, as exogenous substrate, a compound selected from indole, n-hexane, n-octane, n-decane, n-dodecane, cumene, 1-methylindole,  $\alpha$ -,  $\beta$ - or  $\gamma$ -ionone, acridine, naphthalene, 6-methyl- or 8-methylquinoline, quinoline and quinaldine is employed.
19. A process for the microbiological production of indigo and/or indirubin, which comprises
- a1) culturing a recombinant microorganism which produces an indole-oxidizing cytochrome P450 in a culture medium, in the presence of exogenous or intermediately formed indole; or
  - a2) incubating an indole-containing reaction medium with an indole-oxidizing cytochrome P450 monooxygenase; and
  - b) isolating the oxidation product formed or a secondary product thereof from the medium.
20. A process as claimed in claim 19, wherein the indigo and/or indirubin obtained, which was produced by oxidation of intermediately formed indole, is isolated from the medium.
21. A process as claimed in claim 20, wherein the indole oxidation is carried out by culturing the microorganisms in the presence of oxygen at a culturing temperature of approximately 20 to 40°C and a pH of approximately 6 to 9.
22. A process as claimed in claim 20, where the monooxygenase is derived from cytochrome P450 monooxygenase BM-3 from *Bacillus megaterium* having an

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- amino acid sequence according to SEQ ID NO:2, which has at least one functional mutation in at least one of the amino acid sequence regions 172-224, 39-43, 48-52, 67-70, 330-335, 352-356, 73-82 and 86-88, including the substitution Phe87Val.
23. A process as claimed in claim 22, where the monooxygenase has at least one of the following mono- or polyamino acid substitutions:
- a) Phe87Val;
  - b) Phe87Val, Leu188Gln; or
  - c) Phe87Val, Leu188Gln, Ala74Gly.
24. A bioreactor comprising the cytochrom P450 monooxygenase as claimed in claim 1 or a recombinant microorganism transformed by a vector comprising an expression construct comprising a nucleic acid sequence coding for the cytochrom P450 monooxygenase of claim 1 in immobilized form.